AVIATION NEWS
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COVER

Aerial application covers over 8 million acres a year: how good is your ag plane? See page 6.

FAA AVIATION NEWS

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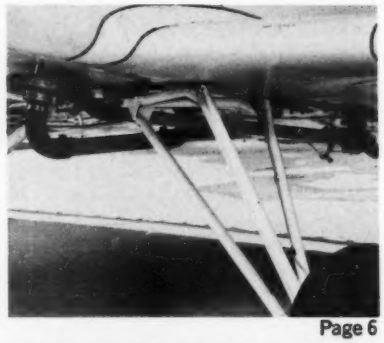

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VOLUME 6 ISSUE 13 SHOULD READ VOLUME 7

ISSUE 2.

WINNERS HONORED

Top Aviation Mechanics Given Royal Tour

Two aviation mechanics whose outstanding contributions to aviation safety have won them handsome plaques and $500 cash awards were honored with a VIP tour of Washington, D. C., and a luncheon at the Aero Club last month.

Top honors in FAA's Fifth Annual Aviation Mechanic Safety Award program went to Robert M. Garmon, of Des Moines Flying Service, for general aviation, and L. Dean Webster, of United Air Lines, for the air carriers. They were selected from 18 semi-finalists by a Flight Safety Foundation panel of key aviation executives.

Garmon, 44, lead inspector for Des Moines Flying Service, Des Moines, Iowa, was cited for "a high level of professionalism and excellence" in the performance of the duties of an aviation mechanic, and particularly for his work in developing a procedure for improving the reliability of portable air data testing equipment used to test altimeters and static systems in general aviation aircraft, as required by FAR 91.170.

He established a known elevation within the Des Moines Flying Service hangar with the aid of a U.S. Coast and Geodetic Survey bench mark located in the area. Using this elevation point and a barometric pressure reading obtained from the Weather Bureau as a control, Garmon could prove the accuracy of his portable air data tester before testing an aircraft system.

By actual demonstration and careful records he proved that the required tests could be performed with a high degree of accuracy using portable testing equipment.

Des Moines Flying Service was subsequently the first repair station in Iowa to be granted the Specialized Service rating for testing both altimeter and static systems on aircraft. Since then, he has helped many other mechanics duplicate his procedure.

Webster, 43, a United Air Lines maintenance specialist, was honored for developing an improved inspection procedure for the sixth stage compressor of the Pratt & Whitney JT8D turbine engine.

Above—Dean Webster inserts light rod and borescope enabling him to see compressor interior. Below—Bob Garmon uses portable air data tester, made more reliable by his testing procedure.

Prior to Webster's development, the only method of inspecting the sixth stage compressor locks was complete disassembly of the first six stages, which required 25 man-hours of work.

Webster combined a high intensity light source with a flexible fiberoptic light rod (a device which bends light) in conjunction with a borescope (a tube with a small mirror at one end that enables one to inspect deep cylindrical cavities) which he inserted into the air bleed manifold through a slot in the seventh stage compressor shroud. The fiberoptic light rod directed the light where it was needed—inside the sixth stage compressor. With the borescope, he was then able to see the compressor blades without disassembly.

Webster was awarded over $11,000 for this safety suggestion by United Air Lines.

The highlight of the mechanics' capital VIP tour was a luncheon at the Aero Club of Washington. There each winner received a handsome medallion, mounted on rich blue velvet, presented by FAA Administrator William F. McKee, and a $300 check from Wayne Parrish, President of American Aviation Publications. Mr. Garmon received an additional check for $200 from Frank Kingston Smith, Executive Director, National Aviation Trades Association, and Mr. Webster, a check for $200 from Mr. Stuart Tipton, President, Air Transport Association of America.

Stops on their VIP limousine tour included the Smithsonian Air and Space Museum, the Lincoln and Jefferson Memorials, the FBI, the Kennedy Memorial, Capitol Hill (where they met their Senators and Representatives), and the White House.

The FAA Aviation Mechanic Safety Award Program for 1968 will open July 1. All who wish to compete or to nominate an outstanding mechanic are urged to do so before December 31. FAA entry forms are available at all FAA field facilities.

Winners are selected on the basis of: (1) design improvements to airframes, engines, or components; (2) development of new or improved maintenance or inspection procedures; (3) demonstration of a "high level of professionalism and excellence" in the performance of the duties of an aviation mechanic.

—Nancy Koplinka

how true is your omni?

Accuracy of NAVAIDS are checked by FAA. Your VOR receiver also needs checking.

On a fine morning in late summer, a 35-year-old pilot-insurance broker accompanied by his wife and three children, took off in a single-engine aircraft for New York City via Atlantic City from Salisbury, Md. Their flight would take them over the resort area of Cape May, N. J.

Shortly after their 7 a.m. takeoff, patches of ground fog began to obscure checkpoints below. Although the flight was VFR and the pilot was not instrument qualified, he was not perturbed. He was used to depending heavily on radio navigation.

His plane was equipped with a VOR receiver and he had set his omnibearing selector to 045 degrees, on the Salisbury VOR, for a straightline course to Atlantic City. He had flown "omni" many times, and it was dead easy. Just crank in the course and keep the needle centered. After a predictable time span—give or take a few minutes. —you would arrive at your destination.

At 7:25, the fog cover began to break up. Through each break in the fog, the pilot saw water—but no sign of the Cape May coast. Assuming that he was still over the lower Delaware Bay, but had veered slightly left of the Cape, he made a 15 degree turn to the right to bring him over land sooner. He moved his omnibearing selector knob to 060 degrees and flew on. His compass bearing was now almost due East, but he decided the omni was more reliable. When land failed to appear after about ten minutes of flight, the first sensation of alarm took hold. He had calculated his enroute time for the 90-mile Salisbury/Atlantic City leg as 45 minutes at 120 mph, a comfortable cruise speed for his airplane. His concern increased when he observed that his compass bearing was almost due East.

By now it was 8:10 and still no land in sight. The fog still hung in closely bunched shreds, and water stretched to the horizon in every direction he looked. Could he have drifted to the seaward side of the Cape? A squadron of destroyers, steaming at full speed 3,500 feet below soon ended all doubt —he had missed the tip of New Jersey and was headed out to sea.

Weather Bureau Error?

Quickly, he tuned in the Atlantic City VOR and the course deviation indicator swung over to the extreme left. He turned into the direction of the needle and reset the omni bearing selector knob until the needle centered. He was surprised to note the needle centered with the bearing selector at 330 degrees—and that he had to fly a compass heading of 340 dgrees to keep the needle centered. At his altitude, the wind had been reported as calm. Was the Weather Bureau at fault?

He arrived over Atlantic City without further incident, and immediately checked with the Weather Bureau: no mistake. Something else had gone radically wrong—but what?

He had committed several basic pilot errors. He had disregarded his magnetic compass and had placed undue confidence in an instrument he was not qualified to use. What he didn't know *(and should have known)*, could have harmed him and his family. *His VOR receiver was out of calibration by 10 degrees.* The 15 degree correction he had made to bring himself over land, plus the 10 degree error in the instrument, gave him a total of 25 degrees off course. Had he continued his course out to sea, the first landfall would have been European soil—or at the bottom of the ocean.

Had he been victim of an in-flight emergency that would have forced him down, a mildly frightening experience might have developed into a tragedy for his whole family.

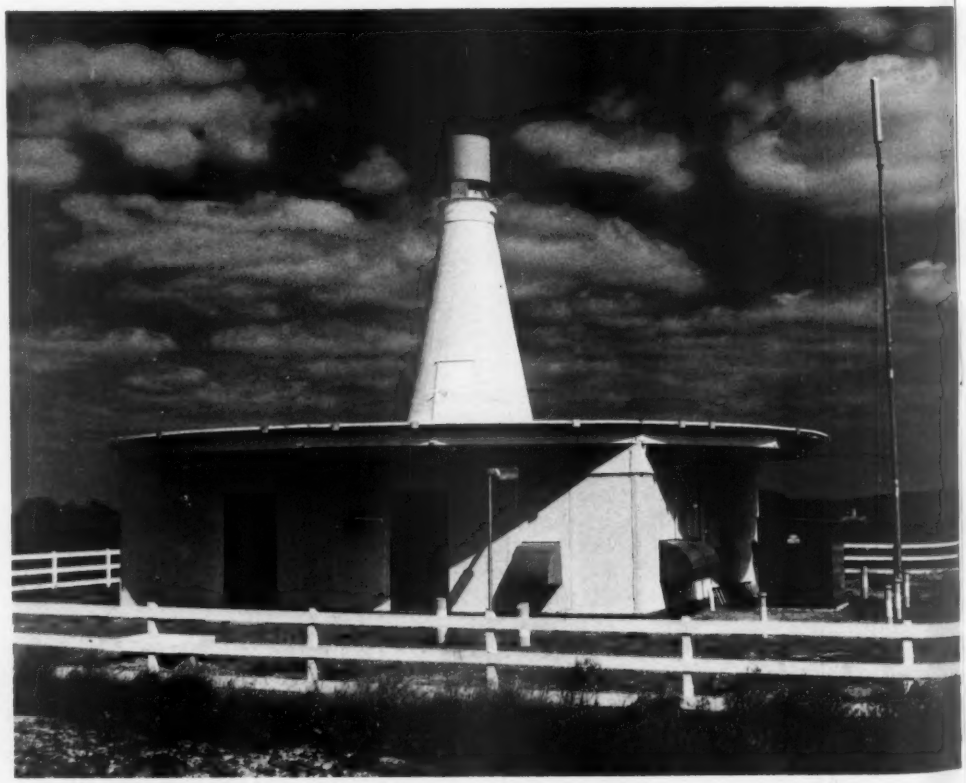
The pilot in question was not on an IFR flight, but he had placed his life and the lives of his family in jeopardy by failing to check the accuracy of the VOR receiver and then placing blind faith in it.

Checking a VOR receiver is a remarkably simple procedure, requiring no tools or instrumentation (other than the receiver itself), and can be done in a few minutes. FAA provides three means by which this may be done: through the use of a VOR test facility, which can be described as a special low-powered VOR; designated airborne check points; and designated check points on the airport surface.

Inflight Check

If none of these are available, a VOR receiver can be checked in flight by selecting a VOR radial that lies along the centerline of an established VOR airway. Fly the aircraft along this radial at a reasonably low altitude over a prominent ground point, which should be at least 20 miles from the VOR. When passing over the ground point, note the bearing indicated on the receiver. Six degrees is the maximum permissible variation between the published radial and the indicated bearing on the VOR receiver.

In addition, independent units in a dual VOR system can be checked against each



other. Both systems should be tuned to the same VOR ground facility and the indicated bearing to the station noted. The maximum permissible variation between the two indicated bearings is four degrees.

Ground and airborne checkpoints are listed alphabetically by category in Part 3 of the Airman's Information Manual (AIM). The location and frequencies of VOR Test Facilities (VOT) are included in the Airport/Facilities section of Part 3 of the AIM. AIM lists 63 airports with VOT.

In using VOT to check the VOR receiver, the position of the aircraft in relation to the VOT is unimportant, as is the direction in which the plane is pointed. However, it cannot function if the plane is in a hangar, or if there are large structures intervening between the aircraft and the VOT.

With the receiver tuned to the published frequency of the VOT, the aircraft radio will receive either a continuous series of dots or a continuous 1020 cycletone. Information concerning an individual VOT signal can be obtained from the local Flight Service Station.

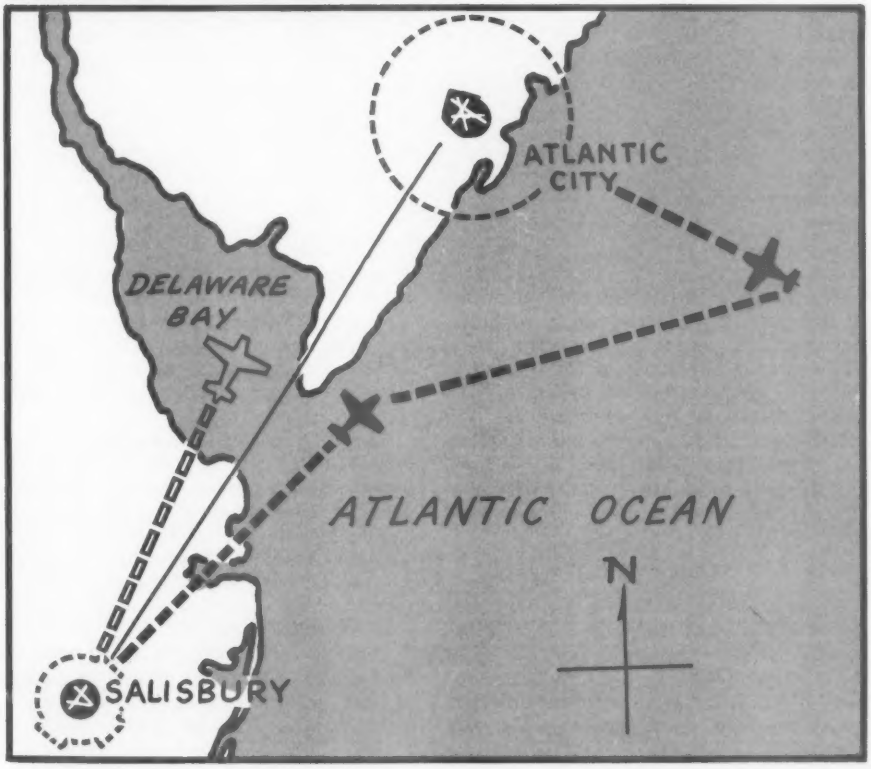
In making the test, the Omnibearing Selector (OBS) is turned to 0 degrees. With this setting, the "to-from" indicator should display a "FROM" indication and the needle should be centered. If the needle does not center, turn the OBS in the appropriate direction until it does. If the Omni-Bearing Selector does not come within plus or minus 4 degrees of 0 degrees, the receiver may not be used for IFR flight, *and may not be relied upon for VFR flight.*

Tolerance Four Degrees

Similarly, when the OBS is turned to 180, the "TO" should be indicated and the Course Deviation Indicator (CDI) should be within plus or minus 4 degrees of 180. If not, moving the OBS so that the CDI centers will give the exact amount of angular deviation.

Bench repair of inaccurate OMNI

MAP:
Because of a 10 degree error in VOR receiver, ETA found aircraft 50 miles at sea instead of over Atlantic City.
Pilot compounded instrument error by ignoring magnetic compass.



VOTs can be used in flight, but the signal is of limited strength because it was primarily intended as a ground checking device. However, its power is adjusted to give an adequate signal to the point on the airport where reception is poorest. This margin of power is often sufficient to give adequate strength to reach an airborne plane some distance from the airport.

Checking a VOR receiver without the use of a VOT is equally simple. Part 3 of the AIM lists some 215 airports having one or more points marked where VOR receivers can be checked. An editorial note helps simplify the terse language in AIM. It says: "The information is provided in the following order: facility name (plus airport name if needed); bearing in magnetic degrees from the VOR; location of the checkpoint (distance in nautical miles); and altitude (in feet MSL, if any). A typical entry will serve as an example of how to proceed: *Bartlesville, Okla. (Phillips): 166°; 4 mi, opposite Trml on parallel taxi strip.*

To make a VOR receiver check, the pilot simply taxis out to the prescribed point on the taxi strip opposite the terminal. The heading of his aircraft is of no importance. He tunes in the VOR facility and turns the Omnibearing Selector to 166 degrees. The indicator should read "FROM" and the Course Deviation Indicator should be centered. If the OBS has to be turned more than 4 degrees, left or right, to center the needle, flight using the VOR receiver should not be attempted without first correcting the cause of the error.

Airborne checking of VOR receivers is generally the same, but a 6 degree tolerance is permitted because of the difficulty in positioning the aircraft directly over the ground point. There are approximately 350 airborne check points listed in Part 3 of the AIM.

350 Check Points

Tune the VOR receiver to the frequency of the Aberdeen VOR, and turn the Omnibearing Selector to 278 degrees. Fly directly over the grain elevator at 2,500 feet. (Direction of flight is immaterial, since the VOR signal is omnidirectional). When directly over the grain elevator, the Course Deviation Indicator should be centered. If the indicated course is greater than 6 degrees plus or minus from 278 degrees, the instrument should be corrected.

VOR receivers can "go out" for a wide variety of reasons, including hard landings. Other causes are vibration, humidity, extremes in temperatures, dust, and simple old age. Conscientious housekeeping in the cabin, a complete understanding of radio navigation, particularly the VOR system, and regular avionics maintenance all add up to increased safety in flight. The common usage of VOR navigation by all types of pilots underscores the necessity of regular accuracy checks, especially in the lighter aircraft, or those used for flight training.

Don't wait until you and your family are all at sea. ■

AG AIRCRAFT

How good is the new generation of aerial applicators?

Moving spray booms up into the wake of the wing decreases drag effect on ag planes. The result is more reserve horsepower, a broader safety margin, and less fuel consumption.

Modern "ag aircraft," designed to dust or spray the more than eight million acres of farm land treated annually in the United States, are basically well suited to its job, according to an FAA study recently completed under contract with the Aerophysics Department of Mississippi State University.

The four airplanes provided by their manufacturers for evaluation were the Snow S-20, the Gruman Ag-Cat, the Callair A-9, and the Piper 25-B (Pawnee).

The study concluded that these aircraft represented a major improvement over general aviation aircraft which have been modified but not designed specifically for agricultural operations. In particular, the new generation of ag planes was commended for improved pilot visibility and cockpit comfort, general flight characteristics and crashworthiness.

However, it was noted that the installation of spray rigs and dust spreaders showed little or no improvement aerodynamically over the earlier generation of ag planes, and that the drag effect of distribution systems greatly reduced the airspeed and climb rate of the aircraft.

The Mississippi study produced the first available data on the drag effect of spray and spreader systems on the flight performance of ag planes, and resulted in a number of recommendations for safer flying and more effective aerial application.

Most aerial applicators recognize that the spray and dust distributor equipment are a high drag source and drastically reduce performance, but few pilots are aware of the extent to which this loss in performance affects safety and economy of the operation.

At 80 mph, for example, a typical aircraft grossing 3,100 lbs. required 120 brake horsepower for level flight in the clean configuration. In the spray configuration, the same aircraft required 160 brake horsepower for the same speed, an increase of 33%. At 100 mph, the power requirements of the spray system were nearly 60 horsepower or 25% of the total installed power. The operating limitations of this aircraft in the spray configuration are obivous.

The maximum *rate of climb* for this (clean) aircraft is approximately 500 feet per minute at a swath speed of 90 mph. For the same aircraft in the spray configuration the maximum rate of climb is reduced 40% to 300 fpm at 90 mph.

Reducing Drag

In an effort to develop a more efficient use of horsepower, the installation of spray booms inside the wing, with only the tip of the nozzles protruding, was studied. However, it was found more practical simply to mount the boom in the *wake of the wing* (rather than below it, where it caused a major disturbance to the flow of air). Results of drag analysis on the new boom installation showed that with proper positioning of the boom and nozzles, only a small penalty in level flight and climb performance was encountered. The standard spray system (boom below wing) required about 205 horsepower for flight at 100 mph; the low drag system (boom in wake of wing) required less than 160 horsepower for the same conditions. Climb performance at the same speed was more than doubled with the spray boom in the wing wake.

These performance gains reflect increased safety because of surplus power available at swath speed and improved economy through lower fuel consumption and less engine wear.

The FAA evaluation showed that other improvements can be made in the aerodynamics of ag airplanes. For example, when an open cockpit aircraft was fitted with a canopy kit, the rate of climb at the normal operating speed was improved 40%. Maximum speed was increased; cockpit noise, a factor which contributes significantly to pilot fatigue, was reduced.

Legendary crop dusters are known for their ability to spin their wheels on cabbage furrows without damaging the crop; the emphasis in ag flying has always been to get

the airplane as close to the crop as possible, without actually harvesting it. Both farmers and operators have held the belief that the lower the aircraft flew, the better the application—especially as regards pesticides.

The FAA ag aircraft study has disproved this theory and actually shown that *because of the influence of ground effect, very low flying airplanes have a less effective distribution than those flown somewhat higher.*

Most ag pilots are familiar with ground effect—the interference with the swirling flow of air over the wingtips of aircraft (wingtip vortices) when the plane is very close to the ground. Vortices tend to help spread the application over a wide swath, since the direction of flow is outward from the wingtip. Ground effect, however, breaks up the vortices and interferes with their distribution of ag materials.

The study determined that the best general application height for crop dusting aircraft was approximately one-half of the wingspan above the ground. The height for maximum swath width should be slightly higher; for maximum penetration, the height should be slightly lower. These distances are given above the ground; for crops with very thick canopies, the height should be raised accordingly. The uniformity of the distribution is greatly improved by the added height because of better mixing of the chemicals in the airflow.

Better Visibility

Flying somewhat higher over the ground also relieves the stress on the pilot, who is in a better position to see and clear field obstacles. Of course, when operating higher over the crop it is necessary to re-calibrate the distributing equipment from the standpoint of swath width and measured output of materials.

Another interesting discovery turned up in the FAA tests was the high cost, in terms of horsepower, of the "free" or wind-driven dispersal system used to spread ag materials —because of the excess drag involvd in the wind-driven system. It was found that most windmill systems have such a low efficiency that approximately 20 horsepower must be taken from the aircraft engine to overcome the drag effect of a *one-horsepower* wind-driven pump. Consequently, development of an engine-driven distributor pump has been advocated.

A limited number of technical reports on the four agricultural aircraft tested in this program are available, on request, from the Aircraft Development Service, Federal Aviation Administration, 800 Indep. Ave. S W, Washington, D. C. 20590, Attn: DS-21.

Pilots have long argued the question as to which is the most efficient way of taking off in a tailwheel aircraft: keep the tail on the ground until lift-off, or raise the tail shortly after moving down the runway? Ag test pilots have shown clearly that the technique of raising the tail before taking off is best. On a standard day, the average takeoff roll using the three-point takeoff was about 1,000 feet, as compared to 900 feet for a tail-up takeoff. Furthermore, in order to clear a 50-foot obstacle, the distance required for a three-point takeoff was 1,550 feet compared to only 1,350 feet for a tail-up takeoff.

It was noted, however, that with a tail-up takeoff the tail must not be raised too soon or the tailwheel will bounce along the ground, causing an impaired performance.

Stall speeds are especially critical to low-flying pilots. Studies in the aerodynamics of ag aircraft indicated that by modifying the wing strut design, more efficient airflow was obtained over the wing, and control would be much better at speeds near the stall speeds.

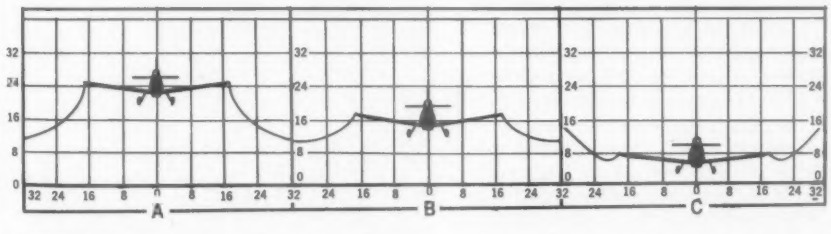
Recommendations

Other results of the Mississippi State contract, still being evaluated by FAA, include recommendations that: (1) a boundary layer type of stall warning system be used in place of the conventional stall warning system, in order to give an extra margin of safety to the ag pilot; (2) a more handy arrangement of cockpit controls would also lessen the burden on the ag pilot—particularly the emergency dump lever should be placed at a convenient location in the cockpit in case of an emergency in the aircraft; (3) every aircraft should be equipped with a combination seatbelt and shoulder harness and every ag pilot should always wear a crash helmet; (4) pilots should have protection in the form of a roll-over structure and they should have wire cutters on the main gear structure; and (5) the hopper should always be in front of the pilot to lessen the possibilities of injury in a crash.

—David Gelfan

(This is the first in a series of articles on aerial application. Subsequent articles will discuss ag pilot training, application techniques and accident avoidance.)

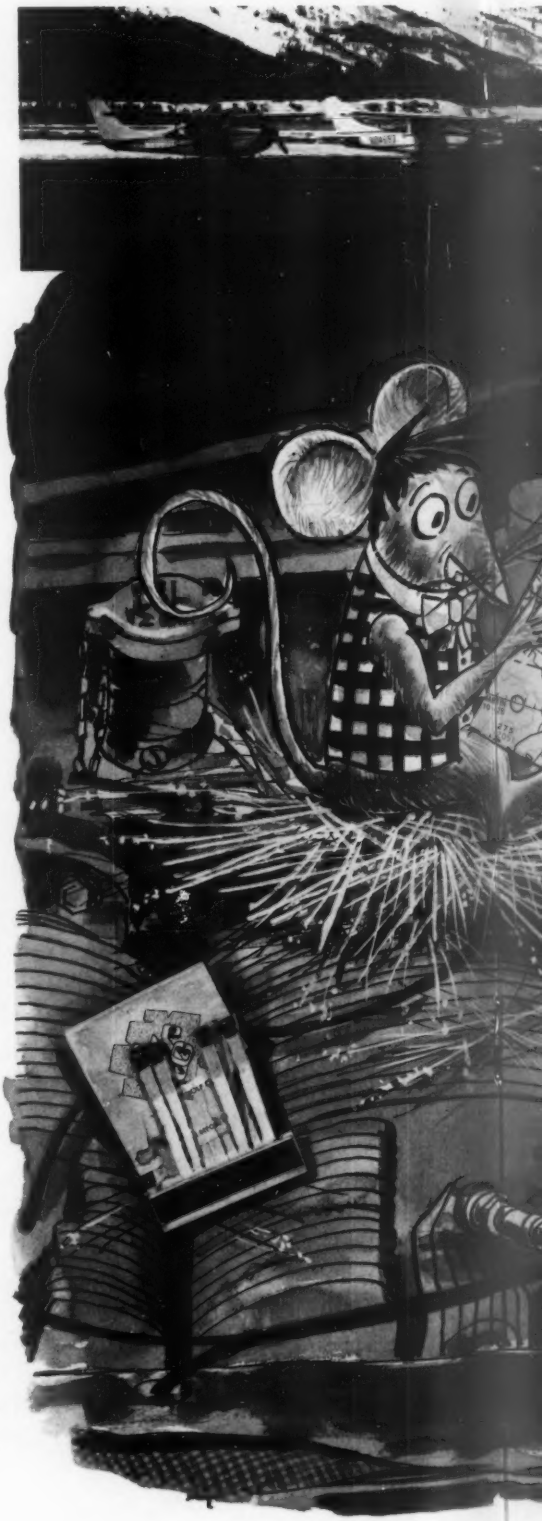
Wingtip vortices are made visible by dispersing smoke from the wings of this ag aircraft. At a height greater than the wingspan of the aircraft ground effect is negligible. Figure under left wheel is a swamper waving flag.



Paths of motion of wingtip vortices are shown to vary with the height above the ground. Center plane is at best height for general application.

THE LONG

Springtime on the airfield ca
attack on the natives, frien



He was a little fellow, scrawny of build, with a pink, whiskery chin, and a timid air, but he managed to live in a style that was the envy of his fellows. His home combined some of the best elements of Frank Lloyd Wright and modern Danish decor, being elevated above the damp earth on silvery struts and built along clean, flowing lines, with a minimum of frills.

He had three curved, tube-like rooms, all connecting with a central hall, which actually served as a parlor. One of the curved rooms was a pantry-storeroom-kitchen, well supplied with the gleanings of field and stream; the next room was a kind of rathskeller dining room, lined with raffia, and cushioned with horsehair; and the third was a bedroom, papered in an offhand, near psychidelic fashion. His mattress was of grass, covered with a yellow material that suggested airplane fabric.

In fact it *was* airplane fabric, since the possessor of this fine home, with the initiative of an enterprising fieldmouse, had located all the furnishing materials he needed within a few yards of the particular aircraft he had selected for his winter abode. From November to May, he had enjoyed the langorous luxury of a snug, warm shelter—absolutely rent free.

On the last day of May his peaceful tenancy was interrupted by the horrendous screech of a propeller twisting fitfully nearby. Without waiting for the hot blast which he knew, from painful experience, would follow, he bailed out immediately, leaving behind his winter's accumulation of straw, husks, bark, string and other possessions which help a mouse while away the long winter nights. Spring was here.

Meanwhile, back in the cockpit the young pilot was thrilling to the first sweet sounds of engine life to assail his ears in six months. The fact that the engine had started with little more effort on his part than a turn of the switch (and a silent, somewhat irreverent prayer) was proof to him that his aircraft was an unusually fine bird, virtually immune to the ravages of time, weather and rodentry.

With eager, trembling hands, he cast loose the tie-downs, flipped off the gust locks and headed down the taxi-way. At the edge of the runway, he performed a quick pretakeoff check, looked about for inbound traffic and rammed the throttle in. The engine gave out a hoarse roar, the wings shook, the aircraft clattered over the runway and the pilot eased back on the wheel with an exultant song in his heart. Up, up and a—!!!

A moment later he had the wheel in his lap and was seated amid the ruins of what had been a $10,000 airplane, now a pile of junk in a cornfield. Nearby, a pink-chinned mouse wept sadly over the loss of his winter mansion. It was a very short Spring.

A really thorough investigation might have put the finger of guilt on the fieldmouse, as having undertaken an unauthorized modification of an aircraft engine (FAR Part 43). But he would have defended himself stoutly with the assertion that it is the responsibility of the operator of an aircraft to ascertain that a stored airplane is fully ready to fly before he sets foot in the cockpit—to make sure that all temporary lodgers have been evicted and all obstructions that might cause an engine to expire during a critical phase, such as climbout, are removed. And he would be right.

Common sense tells us that the less frequently an airplane is flown, the more thorough must be each preflight inspection. Any aircraft that has lain idle over the winter requires an extremely thorough preflight examination, since in addition to being exposed for a long period to the "Four Horsemen of Attrition" (cold, dampness, rust, and dirt), the idle machine invites the tenancy of all manner of wild life.

It is almost impossible to lock rodents out of an aircraft stored outdoors. Squirrels, birds, rats and mice show amazing ingenuity and persistence in finding their way in through exhaust pipes, air inlets, cowl covers, etc. Other creatures gnaw their way in through plastic covers or fabric. Even hangared aircraft may become inhabited by wildlife if undisturbed over a long period of time.

Remnants of nests, banquet leftovers or stored grain in the engine, if not searched out and removed by the pilot in the Spring, can easily cause engine failure. The mere fact that an engine starts up quickly is no assurance that all is clear under the hood—that under the surge of full power it will not suck a wad of rags and string into a vital orifice; only a thorough visual inspection can give this assurance.

Not only rodents but insects also like to nest in idle aircraft, and their abodes are built in all sorts of unsuspected places—inside wheel fairings, underneath the fuselage, in the baggage compartment, etc. More than one pilot has had the unnerving experience of discovering an active wasp nest in his cockpit during his initial takeoff in the Spring.

The key to a good Spring preflight is a systematic examination from tail to spinner (or nose cone). Washing down the aircraft is a good way to begin, so that telltale indications of stress or strain in the skin are not hidden by smudges of dirt or grease. In the course of wiping the aircraft dry, look especially carefully for skin defects around welds or other structural joints. Incipient metal failure caused by stress in flight can be aggravated by winter cold, and there is no better time to spot such possible trouble than during the Spring cleanup.

If your aircraft, like the great majority, has a metal skin, it can be washed safely with any good soap and rinsed with clear water before wiping down. Fabric-covered aircraft should be washed with the materials recommended by the manufacturer. Windows should be cleaned with special

IG LOOK

airfield calls for an all out
ves, friendly or otherwise.

cleaning fluids designed for this purpose, and care should be taken against using abrasive brushes which might scratch or mar the plastic.

During the washdown you will have a good opportunity to examine your aircraft for gasoline, oil or hydraulic fluid leakage. Some types of seals have a tendency to dry out over long idle periods and may need replacing. Rubber deteriorates quickly when exposed to many types of aviation fluids, and electrical shortages may occur when insulation is affected.

The empennage. Tail surfaces should be looked over for loose or worn rivets, bolts, pins and other fastenings. Tears or distortions in the skin or fabric may indicate serious structural displacement underneath, and should be called to the attention of a mechanic. Gust locks should be released, and all hinged surfaces checked for mobility.

Control cables should be examined for signs of rust or chafing, and for smoothness of operation. External bracing should be hand tested for excessive slack or tension, which may have built up during extreme temperature changes. Navigation lights should be in good working order. Tail wheels should be checked for spring and general condition.

Fuselage. The baggage compartment should be checked for undesirable inhabitants and for secure fastening of the door in flight. The cabin interior should be inspected for loose articles or obstructions, worn safety belts, window cracks or discolorations. The fuselage covering should be gone over carefully, in the same manner as the empennage, with special attention given to such areas as static ports, pitot tubes and air intakes.

Wing. Remove control locks and check mobility of all control surfaces. Navigation and landing lights should be tested at this time, and the condition of deicer boots noted. The stall warning vane should be operated manually with the master switch on, to make certain the horn sounds. Fuel tank vents should be clear of obstructions and the filler caps secure; all tanks should be drained for water. The condition of the covering both on the lower and upper surfaces, should be examined as noted above. With a high wing airplane use a stepladder; with a low wing aircraft use a mechanic's creeper, and do a careful job.

Landing gear. The wheels should not be overlooked when the soap and water are at hand. Scrubbing the tires is one good way of observing them for cuts, bruises, or signs of excessive wear. (See FAA AVIATION NEWS for July, for a detailed article on tire care.) Shock absorbers should be tested for give, as well as leakage.

Engine. Before an engine is turned over, make certain of the oil supply. Engine oil deteriorates to some extent on standing, and very slow leakages may result in below-minimum levels in the Spring. Oil also absorbs moisture, which interferes with lubrication. Replacing the oil is always a safe procedure. Oil cooler intakes and carburetor air scoops should be completely freed of all accumulations that might interfere with the passage of air; and filter screens should be securely in place, with covers removed.

Fuel should be flushed through the main drain sumps to remove water. The spaces between cylinders and engine baffles should be gone over carefully, with hand and eye and mirror where necessary, for remnants of bird or rodent inhabitation.

The battery charge should be checked with a hydrometer. If a variance of more than 20 points is noted between cells, recharge or replace the battery. After testing, fill with distilled water to the indicated level.

Caution. Avoid prolonged engine operation on the ground. Many aircraft engines are air pressure cooled and depend on the forward speed of the aircraft to maintain proper cooling. As a rule of thumb, limit ground running to four minutes in cold weather and to two minutes at temperatures above 70° F. Prolonged idling at low rpm may result in fouled spark plugs.

Propellers. Oil leaks around the spinner or hub may indicate internal damages—consult a mechanic. Go over the blade carefully for nicks, rust and depressions. Note: be certain that the master switch as well as the magneto switches are off before you approach the propeller area.

Incidentally, it is a good idea to move aircraft away from any area where loose stones or cinders have accumulated, before starting up the engine. Otherwise the propeller may be damaged by flying debris.

A thorough Spring cleaning and inspection can be done most satisfactorily if proper equipment is on hand. A minimum list of inspection tools recommended by FAA includes:

A small eight-power magnifying glass
A small mirror
A flashlight
A one-inch wire brush
A dull-bladed knife
A round bristle brush
A hydrometer
Cleaning fluid
Lintfree rags
Small tool kit (screwdriver, wrenches, etc.)

A nonskid stepladder and wheel jacks, if needed, may be borrowed from the fixed base operator. The inspection should be carried out in an unhurried manner, and all serious signs of trouble should be reported to a certificated mechanic before the airplane is flown. It's a long, long time from May to November, and a few hours of careful preparation can help assure you of a safe, trouble-free flying season.

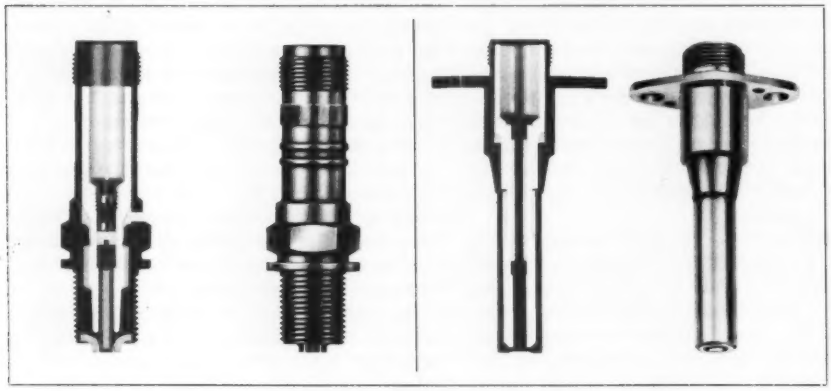
FAA's "Personal Aircraft Inspection Handbook" (Advisory Circular 20-9) is available for $0.50 from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402. ■

Before installing terminal sleeves wipe off connecter with clean, lint-free cloth moistened with cleaner approved by plug maker, or with clean, unleaded gasoline. Be sure plug shielding barrel is clean and dry. Screw connector nut finger-tight, then tighten an additional ¼ turn with suitable wrench. Do not use pliers.

SPARK OF LIFE II

What's Up Front 5

The lowly spark plug is an important clue to the internal condition of your engine. A glance at the electrodes will reveal volumes to the alert pilot.



External and internal views of the spark plug (far left) bears little resemblance to the igniter (right). Little of plug enters cylinder but almost all of the igniter protrudes into combusion chamber. Plug is designed for continuous firing; igniter fires only long enough to "light" the engine.

Unless he is a certificated powerplant mechanic, the aircraft operator is restricted by Federal Aviation Regulation as to the maintenance or repair work he can do on his own engine. Spark plugs are one of the few engine components a pilot or owner can remove, inspect and service on his own. The effort is often well worth while, because the "face" of a spark plug (the electrode tip) can tell him a great deal about the internal health of his engine.

Inspection time *is recommended by the engine manufacturer* and varies with plug type, operating conditions and engine model. When plugs appear to be unusually shortlived, there is good reason to suspect malfunctioning of some other engine component. Servicing or replacing the plugs, in that case, would not get to the root of the problem, although, it might result in a smooth runing engine for a time.

Proper tools are essential to avoid damaging plugs during removal and installation. For example, the shielded terminal connectors are made of very soft metal and can easily be distorted if seized with pliers. A crowfoot, or open end wrench of the proper size is called for.

For actual removal of the plugs from the cylinder, only a deep socket wrench should be used. A six-point wrench is preferable to a 12-point wrench because it gives a greater bearing surface and affords less opportunity for damaging the hexagonal faces of the plug. Before pressure is applied, make sure the socket is seated squarely on the plug. Otherwise, there is great likelihood of slippage, possibly harming the insulator, not to mention one's knuckles.

While spark plugs are remarkably rugged in the performance of their duty, they are easily damaged if dropped. Experienced mechanics make it a habit to replace any plug that is dropped accidentally, because they know that even though no damage may be apparent, microscopic cracks may now exist in the ceramic insulation, leading to trouble eventually. Plugs with deformed electrodes, shells or threading surfaces should be discarded at once.

Mechanics usually keep track of removed plugs by placing them in a rack with numbered holes. This provides a cylinder-by-cylinder "inside" look at the engine, and could reduce maintenance costs considerably by pointing a finger of suspicion in the right direction.

For purposes of examination, compare a removed plug with a new one. The thickness of the electrodes in the used plug is a good indication of the amount of useful life remaining; if the ground electrodes are only half as thick or less than new electrodes, the plug should be replaced. If both center and ground electrodes are excessively eroded, abnormal power operation is indicated (report this to a certificated mechanic).

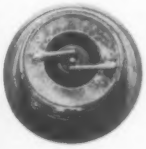
Hard, cinderlike deposits, sometimes called lead fouling, may be an indication that the tetraethyl lead content of the fuel in use is too high for the engine. Poor fuel vaporization or excessively cold operating temperatures could also bring about this deposit.

Black, sooty deposits, on the other hand, usually are a sign of an overly rich idle mixture, or a plug type that is too cold.

Wet, oily deposits may be caused by broken or worn piston rings, excessive valve guide clearances, leaking seals, etc. These, again, are matters which should be drawn to the attention of a mechanic.

Re-usable plugs should be de-greased and cleaned with solvents and methods recommended by the manufacturer. Carbon tetrachloride, incidentally, should never be used in cleaning spark plugs because of its corrosive action. After cleaning, plugs should be dried thoroughly, preferably with com-

Spark Plug Electrodes are Tattle-Tales



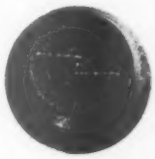
NORMAL—Like-new condition of electrodes show plug to be in service short time and within correct heat range. Inspect closely, clean, re gap and test before reinstalling in engine.

LEAD FOULED—Tiny dots are hard, cinderlike deposits caused by poor fuel vaporization, high tetraethyl lead in fuel or cold engine operation. Clean, regap, test and have mechanic check source of deposits.

WORN OUT—NORMAL—This plug has had a long, useful life in a healthy engine, as indicated by evenly worn electrodes. Remaining thickness of ground electrodes is half of normal. Install new plugs.

CARBON FOULED—Lengthy ground idling, idle mixture too rich, plug type too cold causes black, sooty deposits. Check plug heat range, carburetor setting. Clean, regap, test, reinstall.

WORN OUT—SEVERE—Ground electrodes almost eroded away points finger to abnormal engine power use. Have mechanic check fuel metering, engine for source of damage. New plugs mandatory.



OIL FOULED—Broken or worn piston rings, other internal trouble is indicated by wet, oily deposit on plug. Calls for thorough inspection by mechanic. Clean, regap, test and reinstall plugs.

pressed air, although any source of hot dry air, such as an oven, may be used.

Persons inexperienced in servicing spark plugs may forget that corrosion may exist at both ends of a plug—the terminal connector should not be neglected.

Re-installing plugs calls for even more care than removing them. If a new set of plugs is to be installed, make certain they meet the exact specifications of the manufacturer, including heat range and *reach* (depth of extension into the cylinder). Long reach plugs threaded into an engine designed for short reach will find some of the threads projecting into the combustion chamber, possibly leading to pre-ignition through overheating.

In addition, the threads are likely to be damaged by high-temperature corrosion, which will cause thread seisure in the cylinder head. Lead fouling and carbon tends to accumulate on the threads, which further complicates the problem of removal.

It is advisable to use new gaskets (they cost about a nickel each) when installing plugs—they prevent combustion gas leakage, plug loosening in service, and they afford easier removal for the next plug inspection. Frugal use of anti-seize compound is recommended; a little goes a long way, and none at all should be applied to the first two threads because it might run down and short out the electrodes when the plug get hot.

Run the plugs in as far as they will go by finger pressure, after clearing the threads in the plug port, and make the final tightening using a torque wrench. It is vitally important that the plugs be tightened to the torque recommended by the engine manufacturer; this can only be done by using a torque wrench. Plugs installed at higher than recommended torque values can damage threads, make the plug difficult to remove, and even change the gap setting. Overtorquing can also damage the seal, resulting in plug failure. Under-torqued plugs might work loose in service and could cause preignition by disturbing the heat exchange value of the plug.

After new, reconditioned or cleaned plugs have been installed, the engine should be run up and the magnetos checked.

Turbine engines have no spark plugs; ignition is supplied by igniter plugs, generally two to an engine, which operate only during the starting phase. Once the engine is "lit" the ignition system automatiacly deactivates and the fire in the engine is self-sustaining. While a jet has no magneto, dual ignition is supplied by two identical but independent ignition units which obtain their electrical energy from the aircraft's electrical system. Safety is enhanced by each of the igniters having a complete ignition unit.

Igniters are larger and longer than spark plugs. The central electrode is heavier, and the ground electrode is a solid ring, rather than a multiple of individual points. The spark gap is much wider and, in many cases, the igniter penetrates into the flame tube. The spark may be of high voltage—18,000 to 20,000 volts—or of low voltage—2,000 to 3,000 volts—and the spark has a higher heat intensity (from 5 to 20 joules). These two considerations are made necessary by the poor conditions for combustion, at the higher altitudes normal to jet operation, in the event it becomes necessary to relight the engine in flight.

While the higher voltages needed to "fire" the igniter are more erosive to the igniter's electrodes than is the case in a conventional spark plug, the damage is negligible because the igniter is operated for only a brief time: during engine start, takeoff and landing, and in severe turbulent conditions where rapidly fluctuating air pressures might extinguish the flame.

Igniter inspection is much the same as inspection of coventional spark plugs. Evidence of burning and erosion of the electrode or shell, cracked ceramic insulator, or damage to the threads, or flange are cause for replacement if the damage exceeds manufacturer's recommended tolerances.

When cleaning igniters, the manufacturer's instructions must be followed to the letter. Certain types of igniters have semiconductor material coating on the firing ends; improper cleaning procedure might destroy this coating and lead to igniter failure. Generally speaking, igniters should not be cleaned with wire brushes or subjected to abrasive blasting, wet or dry.

Extreme care must be taken in handling the high energy ignition unit of igniters. The electrical energy which may be stored in the condensers is potentially lethal. It is necessary to disconnect and 'ground' the low tension supply lead and wait for at least one minute to permit the stored energy to dissipate before handling the unit or the high tension cable.

Since the design of competitive sparking devices varies, it is not safe to judge the condition of worn electrodes by comparison with an illustration of a different brand. The same caution applies to all preventive maintenance work.

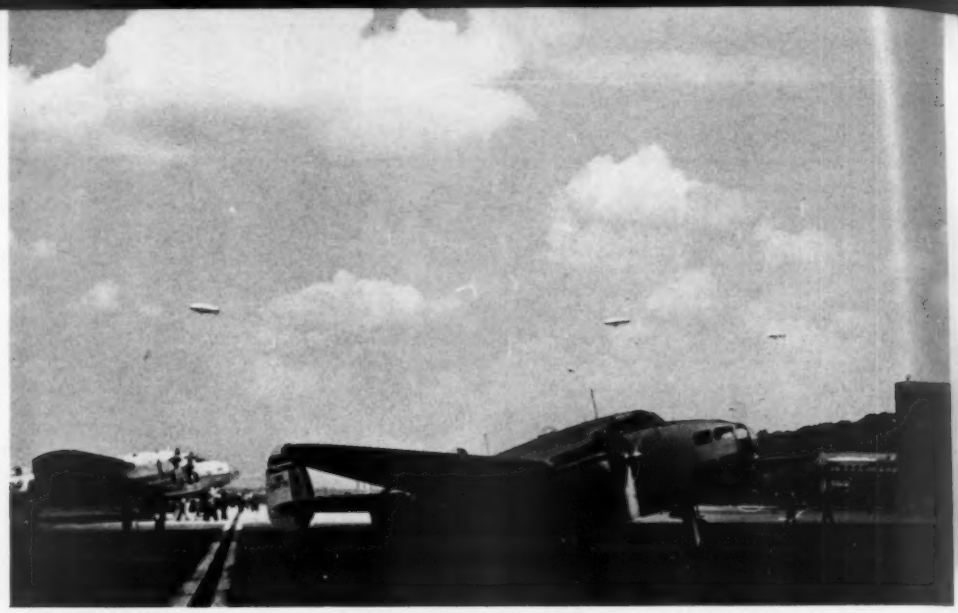
The relatively low cost of sparking components and the pilot's general familiarity with them are not reasons for scanting the attention given them. Complicated aircraft, worth thousands upon thousands of dollars, depend upon the lowly plug for every beat of engine life.

—Frank J. Clifford

famous

FLIGHTS

The youthful Hughes was once nominated as a movie competitor to Gary Cooper.



Lockheed Lodestar, the pre-World War II bomber converted for round-the-world race by Howard Hughes in 1938. Hughes installed new 1,200 hp Wright engines, which powered him around the earth in less than four days.

hustling HOWARD HUGHES

On his globe-girdling flight Hughes (center) took along a crew of four. From left to right they are T. L. Thurlow, navigator; Edward Lund, mechanic-engineer; Hughes; Richard Stoddart, radioman; and Harry McLean Conner, co-pilot.

Thirty years ago Howard Hughes captured the imagination of the world with a series of record-breaking flights.

Prior to establishing himself as one of the nation's foremost aviators, however, Hughes was known primarily as a rather frivolous individual who had inherited a vast fortune from his father (the founder of the Hughes Tool Co.) and who produced motion pictures more-or-less as a hobby. Among his screen credits were such popular and profitable films as "Hell's Angels," "Scarface," and "The Front Page."

But Hughes first love had always been flying. In fact, it was this love which led him, in 1928, to produce and direct "Hell's Angels," a story of air combat over France in World War I. Displaying painstaking attention to detail, he reportedly spent over half a million dollars to buy and recondition World War I fighters and bombers and another half a million to rent or build airfields in the Los Angeles area. "Hell's Angels" became one of the most expensive motion pictures of its day.

Still, it wasn't until he won his first air race at Miami in 1934 that Hughes began to look at flying as something more than an avocation. Not satisfied with the Boeing P-12, which had carried him to victory, he founded Hughes Aircraft Corp. for the purpose of building a faster airplane—one that could recapture, for the United States, the world speed record for land planes.

The product of this effort was the Hughes H-1 racer, an aircraft years ahead of its time. It was one of the first aircraft to incorporate flush riveting in its design, as well as such innovations as leading edge air intakes in the wing, a jet thrust exhaust, drooping ailerons and power-driven retractable landing gear.

On September 13, 1935, the H-1 proved the soundness of its design. With Hughes at the controls, it established a new international speed record of 352 miles per hour over a three-kilometer course at Santa Ana, Calif. The old record of 314 mph had been held by Raymond Delmotte of France.

Hughes now took aim at the transcontinental speed record of 10 hours, 2 minutes and 51 seconds held by Roscoe Turner. The H-1 was not ready to make the flight, however, having been damaged in an emergency landing following its record-setting performance. So Hughes purchased a Northrop Gamma and had it refitted with larger gas tanks and a new Wright Cyclone engine.

By January 1936, the modifications were completed, and Hughes was ready for the transcontinental run. He took off from Burbank shortly after noon on January 13 and landed in Newark 9 hours, 27 minutes and 10 seconds later. Flying most of the 2,450 miles at an altitude of 18,000 feet, he averaged 260 mph, hitting 295 mph on the Indianapolis-Columbus leg.

Still Hughes thought he could do better, so he had the H-1 rebuilt for a transcontinental flight. The flight took place on January 19, 1937, and Hughes succeeded in choping two hours off his record of the previous year. The west-east passage was completed in just 7 hours, 28 minutes and 25 seconds for an average speed of 332 mph.

The next logical step—and one Hughes already was planning—was an around-the-

In 1939 the youthful Hughes, 33, was appointed Technical Adviser to New York World Fair by Grover Whalen, right.

world flight in an effort to break Wiley Post's record of 7 days, 18 hours and 49 minutes. After some deliberation, a Lockheed Lodestar, forerunner of the World War II Hudson bomber, was selected for the job and given the usual Hughes overhaul, including the installation of two new 1,200 horsepower Wright engines.

Shortly after 7 p.m. on July 10, 1938, Hughes departed New York's Floyd Bennett Field on the first leg of his global flight. With him in the silver Lodestar, was a crew of four—a second pilot, a navigator, a radioman and a mechanic.

It took just 16½ hours to reach Paris, faster than anyone had ever made the flight before. After landing, however, it was discovered that the metal skin of the fuselage had buckled near the tail assembly, and 8½ precious hours were lost in making repairs.

The next leg of the flight carried Hughes across Germany—in open defiance of the German Government—to Moscow, where a large and enthusiastic crowd was waiting to greet the American capitalist. Hughes had to waste another two hours disengaging himself from the friendly Russians.

From Moscow, he flew east across the Siberian wilds, stopping to refuel twice—at Omsk and Yakutsk. Seventy-three hours after leaving New York, he arrived back in the Western Hemisphere, landing in Fairbanks, Alaska. Among those waiting to welcome him and wish him "Godspeed" was the widow of Wiley Post.

Minneapolis was Hughes' next (and last) stop after leaving Fairbanks, and he made the flight in just one minute over 12 hours. Refueling took another 34 minutes and then he was off for New York, arriving there to a tumultous welcome at 2:37 p.m. on July 14. He had circled the globe in 3 days, 19 hours and 8 minutes. Wiley Post's record had been cut almost in half. Hughes received a special Congressional Medal commemorating his around-the-world flight in less than four days.

—John Leyden

BRIEFS

• FAA'S RECENTLY REVISED GUIDE for prospective mechanics is now on sale at the U.S. Government Printing Office, Division of Public Documents, Washington, D.C. 20402. The cost of "Airframe & Powerplant Mechanics Certification Guide" is 40c (50c for foreign orders.)

• THE NORTHERNMOST FLIGHT SERVICE STATION in the United States was opened last month at Point Barrow, Alaska, on the frozen shore of the Arctic Ocean. Located on the Will Rogers-Wiley Post Memorial Airport, the newest FSS will offer the FAA air traffic specialists an unusual off-duty sport--polar bear hunting.

• ONE TAKEOFF OR LANDING EVERY 17 SECONDS was the record set recently between five and six p.m. on a Friday afternoon by the controllers in FAA's Chicago O'Hare Airport tower. A total of 208 operations were logged within the hour.

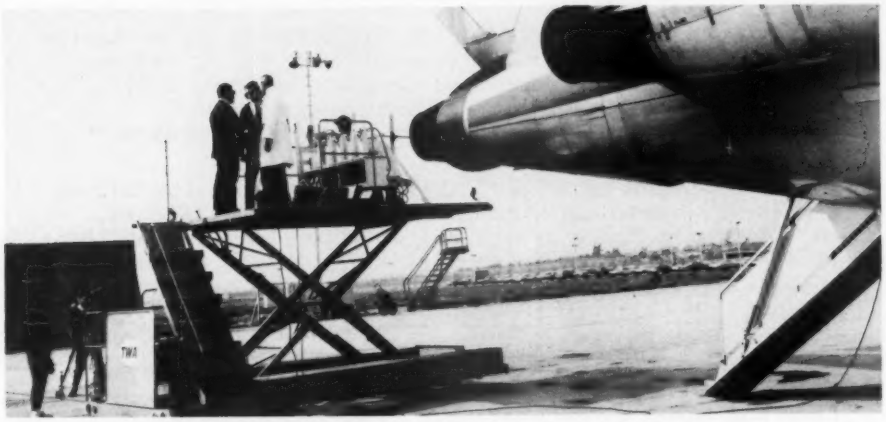
• NEW HOT AIR BALLOON certification standards went into effect on May 10, stiffening criteria for pilots who formerly were required only to pass a written test before casting off. The use of airborne heaters has extended the flight range of hot air balloons so much that the pilot in command is now expected to have the same degree of skill and proficiency as required for gas balloons. The new experience requirement is at least six instructional flights totaling at least six hours.

• A FILM ON V/STOL USE IN THE CITY will be available from FAA in late August. "A Place to Land" shows varied usage of V/STOL aircraft within the confines of New York City. Write to FAA Film Library, AC-921, P. O. Box 25082, Oklahoma City, Okla. 73125.

• CONTROL/STABILITY AUGMENTATION SYSTEM EVALUATION is the leadoff title in a list of 77 new technical and scientific publications available to the public at $3.00 each. The subjects are all aviation-related and can be obtained from the Clearinghouse for Federal Scientific and Technical Information, Springfield, Va. 22151. Individual copies of the list may be obtained by writing to Federal Aviation Administration, IS-10, 800 Independence Ave., S.W., Washington, D.C., enclosing a stamped, self-addressed envelope.

• The S.A.P. Award has been created by the Valley Airmen's Association of the San Fernando Valley in southern California, for those pilots who are lucky enough to survive an incident caused by a pilot blunder which could have resulted in a serious or fatal accident. Nominations should be addressed to: VAA, Box 307, Van Nuys, Calif. 91408.

JET AIR CONTAMINANTS UNDER SCIENTIFIC SCRUTINY



Probes are inserted into the exhaust of an FAA 727 jet aircraft to measure the output of air contaminants from jet aircraft engines. Los Angeles County engineers are in charge.

The exact responsibility of aircraft in air pollution is being studied by the Los Angeles County Air Pollution Control District, with a strong assist from FAA.

In recently concluded tests to determine exactly how much, and what kind, of air contaminants were being discharged into the atmosphere by a Pratt and Whitney JT8D, Los Angeles County asked for and received the loan of an FAA crew and a B-727.

The tests were carried out on the ground at Los Angeles International Airport, with the B-727 burning "Jet A" fuel.

The FAA crew used various power settings to simulate, as closely as possible on the ground, combustion conditions that would be typical of those at idle, approach, climbout, and takeoff.

Los Angeles investigators are seeking to determine the precise mix of chemicals and solid particles in burnt aircraft fuels.

In the portion of the tests participated in by FAA, a representative sampling of exhaust gases was taken by inserting a probe into the jet wake of one of the engines.

Material gathered in this fashion underwent chemical and gravimetric analysis. In the chemical analysis, traces of oxides of nitrogen, unburned hydrocarbons and carbon monoxide were sought.

In the gravimetric tests, solid particles were collected in a carefully measured quantity of distilled water. The primary object of this procedure is the accurate measurement of carbon fall-out.

In a third method of testing used in Los Angeles, sample combustion products were collected by the probe method and passed through a filter. This procedure involves the use of light reflectants on the stained portion of the filters.

FAA has also agreed to loan a Convair 880 and crew for use in subsequent tests at Los Angeles International.

FAA will soon begin a three-year study to examine in detail the air pollution questions as they relate to jet aircraft. The study will embrace the airspace over the contiguous 48 states.

Specific areas of interest will be to (1) develop an acceptable jet exhaust method, (2) define an acceptable jet exhaust pollution level, (3) determine the feasibility of in-flight use of anti-smoke fuel additive, (4) and expedite industry development of smokeless combustors.

FAAP Funds Will Help Construct 41 New Airports

The Federal-aid Airport Program for Fiscal Year 1969 has allocated $74.7 million for construction and improvement of 397 public civil airports.

These allocations provide $7 million to construct 41 new public airports, and $67.7 million to improve 356 existing ones.

The FY 1969 program was developed from a record 773 requests for aid by public agencies, totaling more than $392 million.

Other allocations made under this year's program are: runway extension to accommodate larger aircraft—77 locations; new runways to increase safety and operational capability—86 locations; expanded facilities for use of new type aircraft—22 airports.

Strengthening and reconstruction of runways—52 locations; construction or improvements to accommodate heavier aircraft —52 locations.

Construction or improvements of airports to attract general aviation traffic from congested hub airports—52 locations. Additional facilities at airports providing scheduled or unscheduled air taxi service—70 locations. Acquisition of land for clear zones at the ends of runways for increased safety—130 locations.

More Research Scheduled by FAA On Reducing Fire Hazard of Fuels

Fire hazard test specifications for rating the effectiveness of gelled, emulsified and otherwise thickened safety fuels for aircraft will be done by the U.S. Bureau of Mines under a $28,000 interagency agreement.

FAA has had an active interest in thickened fuel mixtures since 1964. In work done at FAA's National Aviation Facilities Experimental Center near Atlantic City late in 1966 it was demonstrated that a jet engine could be started and operated at various power settings on gelled fuels.

Advanced work is now being conducted by the Naval Air Propulsion Test Center, Aeronautical Engine Department, Philadelphia.

FAA hopes to establish an optimum thickened safety fuel and determine its potential for use in commercial aviation.

Three contracts totaling $138,000 were awarded last month by FAA to continue studies of gelled and emulsified fuels for jet aircraft, to reduce the possibility of fires following a crash.

Aircraft fuel cells, ruptured on impact, release large quantities of raw fuel which may be ignited by contact with hot exhaust pipes or live electrical connections.

Preliminary studies have demonstrated that thickened fuels reduce the rates at which they vaporize, thereby reducing the possibility of fire.

McDonnell-Douglas Corp. received a $57,345 contract to study the compatibility of gelled and emulsified fuels with a jet transport fuel system, and to recommend solutions for problems encountered.

Laboratory tests to compare the fire reducing capabilities of a variety of gels and other thickened or modified fuels will be carried out by the Western Co. under a $52,663 contract.

New research to follow successful FAA studies on thickening jet fuels to reduce crash fire hazard.

FAA Aviation News welcomes comments from the aviation community. We will reserve this page for an exchange of views. No anonymous letters will be used, but names will be withheld on request.

• SFO Area Manager

In the April issue of AVIATION NEWS, your reply to the lead item, "Destination: Mexico" mistakenly identifies the San Francisco Area Manager as William E. Cunningham.

The manager, as you of course know, is Hervey E. Aldridge and his address is 381 Mitten Road, Burlingame, Calif. 94010.

Mr. Cunningham is Chief Advisor, San Francisco International Field Office.

I am certain your readers will appreciate the correction.

Eugene Kropf
FAA Public Information Officer
Los Angeles, Calif.

• Planning Ahead

I am interested in starting an FAA approved avionics repair station upon my release from military duty. I would like to know where I can get a list of requirements necessary to meet FAA standards.

Oak Harbor, Wash.

An applicant for a repair station certificate and rating must have the necessary facilities, equipment, personnel and materiel to support the ratings applied for. This is defined in Federal Aviation Regulations, Part 145. Ratings referred to as "avionics" fall within the scope of Radio, class 1, 2, and 3 Repair Station ratings.

Persons directly in charge of maintenance functions performed by a repair station must be appropriately certificated. Requirements for mechanic and repairman certification are covered in FAR Part 65. Copies of FAR 65 and 145 have been sent to you.

For more complete information concerning your specific qualifications and requirements we suggest you contact, by mail or in person: Federal Aviation Administration, General Aviation District Office, Room 104, FAA Building, Boeing Field, Seattle, Wash. 98108. Telephone: 583-0111.

Good luck in your venture.

• Digital Altimeter Readout?

The February AVIATION NEWS carried an article on altitude warning devices, citing a typical incident where the crew of an airliner misread their altimeter by 10,000 feet. The conventional altimeter, by its basic design, is easily misread.

I think a digital readout altimeter would help prevent misreading and promote safety.

Ed Francois
Wayne, N. J.

The trend in both military and civil aircraft is toward a combination pointer and digital counter display for altimeters. Even these displays may vary in several ways as to what numbers need be shown.

We believe an altimeter, besides reading altitude, should also provide some indication of the rate of altitude change even though a Vertical Speed Indicator is mounted elsewhere on the instrument panel.

Many modern turbojet aircraft are presently equipped with drum type altimeters. On most of these the numerals are affixed to rotating drums. As the aircraft climbs or descends, parts of a number will appear in the viewing aperture. Drum type altimeters can be misread by 1,000 feet, however, it is possible to misread the three pointer altimeter by as much as 10,000 feet.

These are among the reasons why FAA feels that an automatic warning device to alert the pilot that he is approaching his assigned altitude would contribute significantly to safer flight.

• Indian Sign

Your article on "Jet Perception" in the March issue lists a selection of the faster piston-powered business aircraft. The Piper Aircraft Corp., which we represent, feels that the Piper Navajo, 6 to 9 place executive transport and commuter airplane, belongs on that list. The Turbo Navajo's characteristics are: top speed, 260 mph, cruise, 247 mph, stall speed 71 mph.

William D. Strohmeier
New York City

• Wants Share of "Boom"

I'd like an opportunity to participate in the growth of air mail routes mentioned in the article "Air Taxi Business is Booming" in the March issue.

Can you put me in touch with the right party so that I can get details and specifications as to what is needed?

St. Charles, Mo.

The Post Office advises us that you should write or visit your nearest Post Office Regional Office for prompt and complete information. Since you live in Missouri, you should contact the Director of Transportation, Post Office Department, St. Louis, Mo. 63199.

• Those Little Old Mapmakers

Contrary to a recent letter in FAA AVIATION NEWS, I think the new sectionals are just great! There is something about the way the topography is printed that makes them much easier to read and I did take the trouble to read the explanation as to how to plot a course from one side to the other. It's also good to have so much area coverage on one sheet of paper, front and back.

As far as I am concerned the time and money involved to produce this new format has been well spent and someone should be complimented for an excellent job.

John Aitkens
Santa Cruz, Calif.

The new sectionals are the product of a joint effort. The idea is credited to FAA's Flight Information Division, which coordinated the efforts of the Departments of Defense and Commerce. The entire project was under the auspices of the Inter-agency Cartographic Committee (IACC). FAA derived helpful input from aviation industry representatives on the committee and the flying public at large.

• Much Ado About Meacham

I would like to pass out some praise for the flight service station and control tower personnel at Meacham Field, Ft. Worth.

Even though Meacham has a large volume of student traffic, the controllers are extremely patient and understanding with even the most inexperienced student. I have visited the tower many times and always learned somethings which will help me be a safer pilot.

On a recent cross country flight from Meacham to Minden, La. in "ceiling and visibility unlimited' weather, I received the red carpet treatment from FAA's smooth working team of ATC professionals. Ft. Worth approach handed me to Dallas approach, which asked me if I would like traffic advisories.

When I said I would, they handed me to the Ft. Worth center. The center carried me across east Texas and north Louisiana to Shreveport approach. The experience was educational, as I am working toward an instrument rating.

Ft. Worth, Texas

• Coast Guard Aloft

In your "Famous Flights" section of the March AVIATION NEWS, the article "Hop-Skip-Jump: Navy Flyers First to Cross Atlantic" was in error.

The headline should read: "Navy/Coast Guard Flyers . . .". The co-pilot of the NC-4 was Lt. E. F. Stone, U. S. Coast Guard. Let's give credit where credit is due.

Ensign, U. S. Coast Guard Reserve
Robert T. Ritchie
Ellington, AFB, Texas

Right you are. Lieutenant Stone was indeed a member of the USCG. Meet the rest of the NC-4 crew (left to right): Chief Special Mechanic E. H. Howard; Lt. J. L. Breese; Lt. (JG) W. Hinton; Lt. E. F. Stone; and Lt. Cmdr. A. C. Read.

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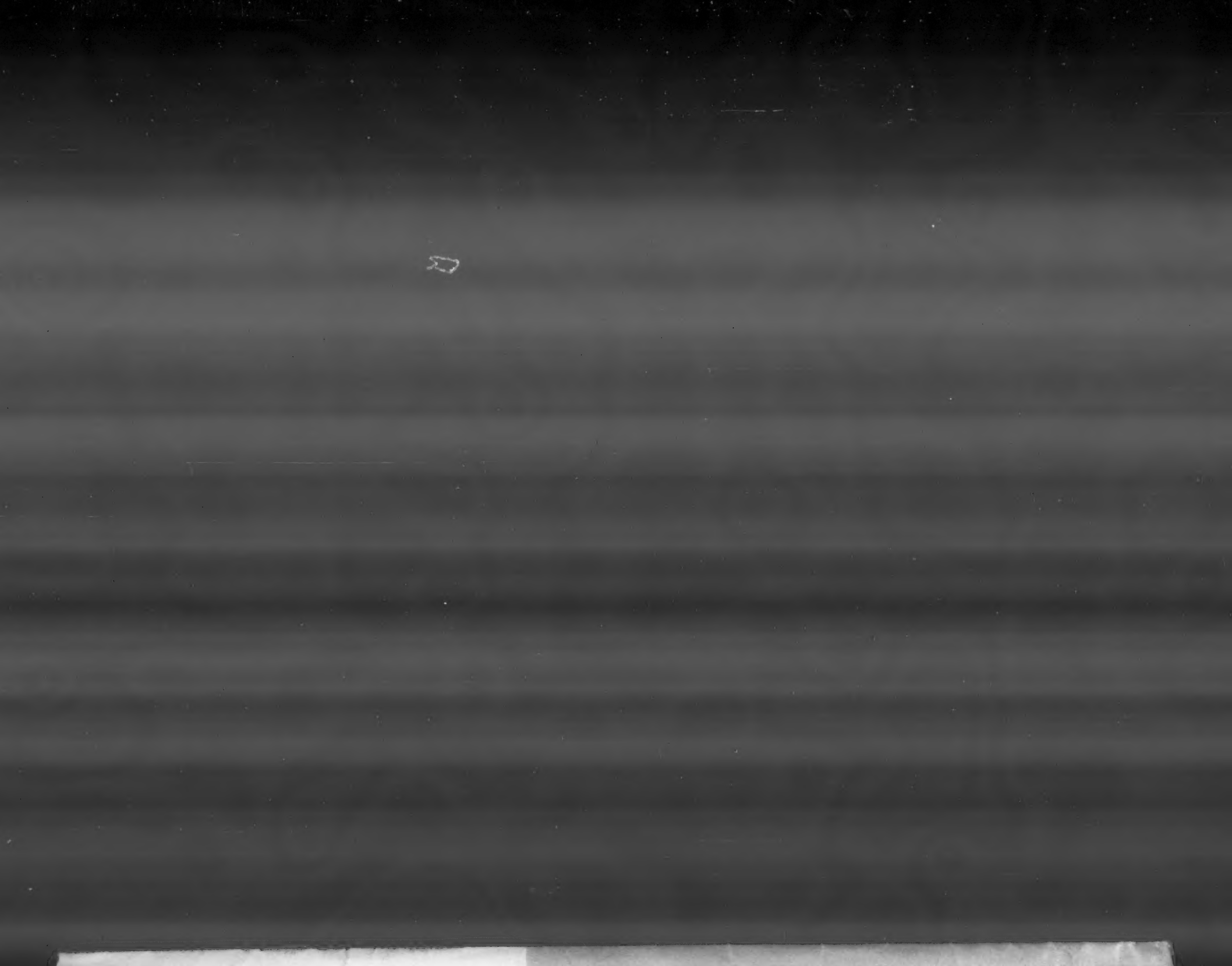
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